**Basis for Amendments to the Claims**

The Applicants have amended Claim 58, consistent with the claim objections by the Examiner in paragraph 3 of the Office Action. No new subject matter is introduced by these amendments to the claim.

## DISCUSSION

### Priority

Applicants acknowledge that the papers submitted under 35 U.S.C. Section 119 were admitted and placed in the record.

### Specification

Applicants also acknowledge that the amendment to the specification recently submitted has been accepted.

### Claim Objections

The USPTO objected to Claim 58. Applicants have amended Claim 58 to remove the informalities, without adding any new subject matter.

### Claim rejections under 35 USC §103

The USPTO rejected Claims 16-28, 35-48, and 50-63 under 35 USC §103 as being unpatentable over Katovic, et al. in view of Rosinski, et al., Kuhl and Sumitani, et al., as previously asserted in the Office Action of October 2, 2009. In addition, the USPTO has now cited Kresge, et al., U.S. Patent No. 4,599,475 in combination with the previously cited references. Kresge, et al. has been cited for the teaching that precipitated silicas of the claimed zeolites have a surface area of less than 200 $m^2/g$ as disclosed at Col. 9, lines 18-22. Applicants respectfully traverse each of these rejections.

**The Invention**

Applicants developed a process for the production of a new zeolite of the ZSM-12 type, which is particularly useful for a number of reactions with organic materials, including specifically hydroisomerization of saturated linear hydrocarbons having a carbon number of more than 5. It was discovered that when the claimed process is used for synthesis of the novel ZSM-12 zeolite, advantageous properties of that ZSM-12 zeolite are exhibited. This novel process comprises a) preparing a synthesis gel in an aqueous solution or suspension comprising 1) an aluminium source, 2) a silicon source, comprising a precipitated silica having a BET surface area less than or equal to 200 $m^2/g$, 3) $TEA^+$ as the template, 4) an alkali metal or alkaline earth metal ion source M having a valency of n, and 5) wherein the molar $H_2O:SiO_2$ ratio of the gel is within the range from 5 to 15; b) crystallizing the synthesis gel under hydrothermal conditions while being stirred, so as to obtain a solid; and c) removing the solid from the solution in order to obtain the ZSM-12 type zeolite, wherein the ZSM-12 zeolite has a primary crystal size less than or equal to 0.1 µm; and a specific volume, determined by mercury porosimetry at a maximum pressure of 4,000 bar, of 30 to 200 $mm^3/g$ in a pore radius range of 4-10 nm.

The primary reference cited by the USPTO is Katovic, et al. which disclose a method of synthesizing ZSM-12 zeolites. However, there are several distinctions between the process disclosed in Katovic, et al. and those of the process, as claimed. Several of these distinctions have been acknowledged by the USPTO.

Specifically, Katovic, et al. teach a $H_2O:SiO_2$ molar ratio of 20. (See Abstract, Table 1 and Figures 1 and 2.) The USPTO asserts that Katovic, et al. is silent as to $H_2O:SiO_2$ molar ratios other than 20 for use in the process producing a ZSM-12 material. The USPTO attempts to limit this disclosure by stating that the disclosure of $H_2O:SiO_2$ molar ratio is only present in the Abstract of Katovic, et al. Note however that this ratio is also the ratio of all Examples disclosed in Table 1 and Figures 1 and 2 on pages 970 and 971 of Katovic, et al. A person skilled in the art reviewing the entire disclosure of Katovic, et al. would immediately recognize the importance of the only disclosed $H_2O:SiO_2$ ratio of 20.

There are also several significant additional distinctions between the present Application and what is disclosed by Katovic, et al. The method of synthesis is different. To emphasize the distinction between zeolites formed using processes where the $H_2O:SiO_2$ ratios of the gel were 20 or greater and zeolites formed from the process of the invention,

Applicants filed comparative test results with the EPO during processing of the corresponding PCT Application, a copy of which was attached to the earlier Amendment, as Exhibit A. They showed that zeolites, formed using the process of the invention, but with a ratio of $H_2O:SiO_2$ at 20:1 or higher, as disclosed by Katovic, et al., were not ZSM-12 zeolites but rather MFI zeolites. If desired, Applicants will present this comparative test data in the form of an affidavit.

In addition, Katovic, et al. fail to teach the stirring of the mixture during the crystallization process, a required element of the claims.

Further, Katovic, et al. are silent as to the BET surface area of the silica used or the physical characteristics of the produced ZSM-12 zeolite, which are specifically claimed by Applicants.

To overcome the deficiency in molar ratio of $H_2O:SiO_2$ in Katovic, et al., the USPTO cited Rosinski, et al. Rosinski, et al. disclose a method for producing ZSM-12 zeolites. In one example, Example IV, a process was disclosed for producing a ZSM zeolite with a molar $H_2O:SiO_2$ ratio of about 13.5. However, the process of Rosinski, et al. is entirely different from Applicants' process, and also different from the process of Katovic, et al., as Rosinski, et al. teach that colloidal silica is the required silica source. (See Example IV, Col. 11,

line 16 as well as all other Examples.) In contrast, Katovic, et al. and the Application teach that the form of silica that must be use for production of a ZSM-12 zeolite is "**precipitated silica**". "On the contrary, by using precipitated silica the co-crystallization of ZSM-5 and ZSM-12 zeolites was not observed (Samples 2 and 4.)" Katovic, et al, page 969.

This distinction between the use of colloidal silica and precipitated silica was important to Applicants. The particular type of silica chosen, when using Applicants' process, produced distinctively different zeolite products. In the Application, Inventive Examples 1 and 9 used "precipitated silica" while "Comparative Example 5" used "colloidal silica". The zeolite product produced in Comparative Example 5, using colloidal instead of precipitated silica, contained 30% ZSM-5, instead of ZSM-12, as a by-product. (See Example 5.) In addition, the physical characteristics of the zeolites produced by Inventive Examples 1 and 9 vs. Comparative Example 9 were quite different, as shown in Table 5 on page 28 of the Application.

Thus, a person skilled in the art would not combine the process of Katovic, et al. with that of Rosinski, et al. as the choice of the type of silica is opposite, i.e. one teaches using "colloidal silica" (Rosinski, et al.), while the other states that only "precipitated silica" should be used (Katovic,

et al.). Thus, the process of Rosinski, et al. teaches away from the disclosure of Katovic, et al. or the Application.

The obviousness rational addressed in *KSR* was premised on combining elements known in the prior art. However, as stated in *Ex Parte* Whelan, 89 USPQ 2d 1078, 1084:

> The *KSR* Court noted that obviousness can not be proven merely by showing that the elements of a claimed device were known in the prior art; it must be shown that those of ordinary skill in the art would have had "apparent reason to combine the known elements in the fashioned claim."

There is clearly no "apparent reason" to combine Katovic, et al. with Rosinski, et al., as each teach exactly opposite processes for the production of ZSM-12.

To further distinguish the composition as claimed from the cited references, Applicants previously amended the claims to introduce a limitation of a BET surface area of the silica source of less than or equal to 200 $m^2/g$. The USPTO acknowledges that this limitation is not disclosed by Katovic, et al. and Rosinski, et al.

In order to show the claimed surface area of the precipitated silica that is used for the production of the ZSM-12 type zeolite claimed by Applicants, the USPTO cited Kresge, et al. In fact, Kresge, et al. disclose an entirely different zeolite product used for an entirely different process with an entirely different structure. The present invention discloses a

process for preparing a ZSM-12-type zeolite for catalytic hydroisomerization of higher paraffins. As recited on page 17, second paragraph of the Application, higher paraffins are understood to mean saturated linear hydrocarbons having a carbon number more than 5 and, in particular, the catalyst is intended for the hydroisomerization of N-heptane and N-octane.

In contrast, Kresge, et al. disclose a process for the isomerization of unsaturated aromatic hydrocarbons, in particular for the isomerization of xylenes, using a **ZSM-23** type zeolite. There are several significant differences between zeolites of the ZSM-12 type and the ZSM-23 type, in particular, their pore size. A ZSM-12 zeolite is a large pore zeolite, the structure of which comprises 12 membered rings as the largest ring in their structure. Due to the 12 membered rings, this type of zeolite has a free diameter of 0.6 nm. On the other hand, ZSM-23 is a medium pore diameter comprising 10 membered rings, resulting in a free diameter of 0.45 nm. (See the differences shown below.)

12 MR ZSM-12 10 MR ZSM-23

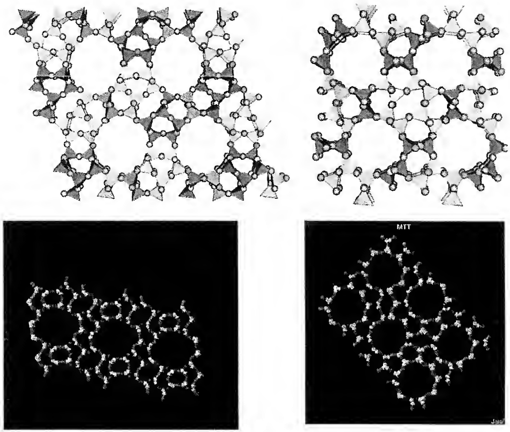



Figure 1: Structural models of ZSM-12 and ZSM-23 type zeolites.

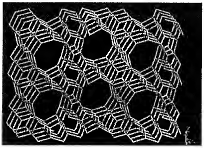
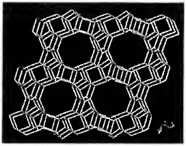
| ZSM-23 | ZSM-12 |
|---|---|
|  |  |
| Pore Opening in Å: **4,5 x 5,2** | Pore Opening in Å: **6,0 x 5,9 x 5,6** |
| Framework Type MTT | Framework Type MTW |
| Ring Size (#T-atoms): **10**, 6, 5 | Ring Size (#T-atoms): **12**, 6, 5, 4 |
| Channel system: 1-dimensional | Channel system: 1-dimensional |

Table 1: Structural differences between ZSM-12 and ZSM-23 type zeolites.

Because of this difference in pore size, these two zeolites have different fields of catalytic application. The pore size of the zeolite catalyst is critical for catalytic selectivity for hydroisomerization. While ZSM-12 type zeolites are particularly suitable for isomerization of aliphatic paraffins, as disclosed by the present Application, ZSM-23 type zeolites are especially preferred for isomerization of aromatic hydrocarbons, in particular, o- and m-xylenes. Another field of application for ZSM-23 zeolites is the hydroisomerization of hydrocarbons with very long aliphatic chains (waxes).

A person skilled in the art seeking to discover an improved zeolite for catalytic hydroisomerization of higher olefins, in particular having a carbon atom number of 7 or 8, would not consider Kresge, et al. as being of any relevance as it employs a completely different type of isomerization reaction, using a different catalyst, namely a ZSM-23 catalyst, which is known to have a different structure and different application compared to a ZSM-12 catalyst.

The fact that precipitated silica having a surface area 140 to 160 $m^2/g$ is used to form a ZSM-23 catalyst would not motivate a person skilled in the art to combine the teachings of Kresge, et al. with the teachings of Katovic, et al. or Rosinski, et al. which disclose ZSM-12 zeolites. It is simply

not proper to combine teachings which disclose a process to produce a ZSM-23 catalyst when trying to determine the best process to produce ZSM-12 zeolites. As noted above, obviousness can not be proven merely by showing that the elements of a claimed device were known in the prior art. There are literally dozens of ZSM zeolites, artificial and natural. Why would a person skilled in the art select a process for producing ZSM-23, when he was creating a ZSM-12 zeolite? It must be shown that a person of ordinary skill in the art would have had an "apparent reason" to combine the known elements in the same fashion to claim the invention, see *KSR*. Accordingly, no person skilled in the art would combine the teachings of processes to produce a ZSM-23 catalyst with those for a ZSM-12 catalyst. Thus, the teachings of Kresge, et al. are not relevant to the patentability of this Application or any of the claims thereunder.

The teachings of Kuhl do not overcome the deficiencies in Katovic, et al. and Rosinski, et al. or add to their teachings, as Kuhl was merely cited to disclose that the reaction mixture may be either static or stirred. (Page 6 of Office Action.)

Finally, it is also not necessary to discuss the teachings of Sumitani, et al., as Sumitani, et al. was cited merely to disclose a process for producing ZSM-12 zeolites utilizing washing with pure water until the ion conductivity of the wash

water is less than 50 µS/cm. (See paragraph 8, page 10 of the Office Action.)

Neither of these references overcome the deficiencies in the disclosures of the combination of Katovic, et al., Rosinski, et al. and Kresge, et al.

Accordingly, none of the references teach each of the unique elements of the inventive process for producing a zeolite of the ZSM-12 type, as claimed by Applicants. In fact, the teachings of the primary references, Katovic, et al. and Rosinski, et al. are in an irreconcilable conflict as to an important process step. The teachings of Kresge, et al. are also in conflict with the teachings of Katovic, et al., Rosinski, et al. and the Application. In cases in which the prior art teaches away from a chemical composition recited in the claims, obviousness can not be proved merely by showing that each of the elements, as claimed, is present. See *Ex Parte Whelan, id.*

Because of these distinctions in the teachings of the cited references, a person skilled in the art would not know which features of the processes of the various cited references should be combined. What should be the molar $H_2O:SiO_2$ ratio when the references are in conflict? What should be the type of silica used to form the gel? What should be the BET surface area of the silica source when it is not taught by any of the

relevant references for the production of ZSM-12 catalysts? It can not be asserted that the properties of the combined references would be the same as is claimed when a person skilled in the art does not know what process steps from which references to choose because of the conflict among the references.

Applicants believe that this amendment can be considered by the Examiner even after a final Office Action as there is no new search necessary and the only significant addition in the response relates to a reference added by the USPTO, which Applicants assert can not be used to disclose any element of the invention.

**CONCLUSION**

Applicants respectfully assert that all bases for rejection of the claims of the Application have been overcome and request the issuance of a Notice of Allowability. If there are any questions, please contact Applicants' counsel.

Respectfully Submitted,

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DATE: May 25, 2010

**CERTIFICATE OF EFS SUBMISSION (37 C.F.R. § 1.8(a)(i)(1)(C))**

I hereby certify that, on the date shown below, this correspondence is being submitted to the Patent and Trademark Office via the Office Electronic Filing System in accordance with § 1.6(a)(4).

Date: May 25, 2010

Holly Hart
Signature

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